

CLAIMS

What is claimed is:

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1. A fuel-control manifold, comprising:
 - a non-integral body comprising at least three pieces joined together and including an upper body segment, a middle body segment, and a lower body segment;
 - a tank port in the upper body segment;
 - an engine supply port in the upper body segment;
 - a fueling port in the upper body segment;
 - a shutoff valve in the upper body segment, the shutoff valve including a controllable shutoff valve closure having a shutoff-valve first side in fluid flow communication with the tank port and a shutoff-valve second side in fluid flow communication with the engine supply port and with the fueling port;
 - a defueling port in the lower body segment;
 - a vent port in the upper body segment; and
 - a defuel/vent valve in the middle body segment, the defuel/vent valve comprising
 - a controllable ball-valve defueling closure having a defueling-valve first side in fluid-flow communication with the shutoff-valve second side and a defueling-valve second side in fluid-flow communication with the defueling port, and
 - a controllable ball-valve vent closure having a vent-valve first side in fluid-flow communication with the vent port, and a vent-valve second side in fluid-flow communication with the defueling-valve second side,wherein the defueling closure and the vent closure being mounted on a common defuel/vent valve stem, and
wherein the defueling closure and the vent closure cannot be open at the same time.
2. The fuel-control manifold of claim 1, wherein the shutoff valve closure is a ball-valve closure.

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P.4 3. The fuel-control manifold of claim 1, further including an instrumentation port in the upper body segment, the measurement port being in fluid-flow communication with the shutoff-valve second side.

4. The fuel-control manifold of claim 1, wherein the defuel/vent valve has no elastomeric materials therein.

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P.5 5. A fuel-control manifold, comprising:
a body;
a tank port in the body;
an engine supply port in the body;
a fueling port in the body;
a shutoff valve in the body, the shutoff valve including a controllable shutoff valve closure having a first shutoff-valve side in fluid flow communication with the tank port and a second shutoff-valve side in fluid flow communication with the engine supply port and the fueling port;
a defueling port in the body;
a vent port in the body; and
a defuel/vent valve in the body, the defuel/vent valve comprising a defuel/vent valve closure structure including
a controllable ball-valve defueling closure having a first defueling-valve side in fluid-flow communication with the second shutoff-valve side and a second defueling-valve side in fluid-flow communication with the defueling port, and
a controllable ball-valve vent closure having a vent-valve first side in fluid-flow communication with the vent port, and a vent-valve second side in fluid-flow communication with the defueling-valve second side, wherein the defueling closure and the vent closure are mounted on a common defuel/vent valve stem, and wherein the defueling closure and the vent closure cannot be open at the same time.

6. The fuel-control manifold of claim 5, wherein the body has three separate

segments that are joined together, and wherein the shutoff valve is in an upper body segment and the defuel-valve is in a middle body segment.

7. The fuel-control manifold of claim 5, wherein the defuel/vent valve closure structure has no elastomeric materials therein.

8. The fuel-control manifold of claim 5, wherein the shutoff valve closure is a ball-valve closure.

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#12 9. The fuel-control manifold of claim 5, further including an instrumentation port in the body, the measurement port being in fluid-flow communication with the shutoff-valve second side.

10. A fuel-control manifold, comprising:

a body;

a tank port in the body;

an engine supply port in the body;

a fueling port in the body;

a shutoff valve in the body, the shutoff valve including a controllable shutoff valve closure having a shutoff-valve first side in fluid flow communication with the tank port and a shutoff-valve second side in fluid flow communication with the engine supply port and the fueling port;

a defueling port in the body;

a vent port in the body; and

a defuel/vent valve in the body, the defuel/vent valve including a defuel/vent valve closure structure providing alternative controllable fluid communication between the defueling port and the shutoff-valve second side in a first operating position, and between the defueling port and the vent port in a second operating position, the defuel/vent valve closure structure having no elastomeric materials therein.

11. The fuel-control manifold of claim 10, wherein the body has three separate segments that are joined together, and wherein the shutoff valve is in an upper body segment and the defuel-valve is in a middle body segment.

12. The fuel-control manifold of claim 10, wherein the shutoff valve closure is a ball-valve closure.

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A7 13. The fuel-control manifold of claim 10, further including an instrumentation port in the body, the measurement port being in fluid-flow communication with the shutoff-valve second side.

14. The fuel-control manifold of claim 10, wherein the defuel/vent valve closure structure comprises
a controllable ball-valve defueling closure having a first defueling-valve side in fluid-flow communication with the second shutoff-valve side and a second defueling-valve side in fluid-flow communication with the defueling port, and
a controllable ball-valve vent closure having a vent-valve first side in fluid-flow communication with the vent port, and a vent-valve second side in fluid-flow communication with the defueling-valve second side, and wherein the defueling closure and the vent closure are mounted on a common defuel/vent valve stem.

15. The fuel-control manifold of claim 10, wherein the defuel/vent valve closure structure comprises at least one nonmetallic solid component, and wherein each nonmetallic solid component is a thermosetting polymer.

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A8 16. A fuel-control manifold, comprising:
a body;
a tank port in the body;
an engine supply port in the body;

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a fueling port in the body;
a shutoff valve in the body, the shutoff valve including a controllable shutoff valve closure having a shutoff-valve first side in fluid flow communication with the tank port and a shutoff-valve second side in fluid flow communication with the engine supply port and with the fueling port;
a defueling port in the body;
a vent port in the body; and
a defuel/vent valve in the body, the defuel/vent valve comprising
a defueling-valve first side in fluid-flow communication with the shutoff-valve second side and a defueling-valve second side in fluid-flow communication with the defueling port, and
a vent-valve first side in fluid-flow communication with the vent port, and a vent-valve second side in fluid-flow communication with the defueling-valve second side,
wherein the defueling closure and the vent closure cannot be open at the same time, the shutoff valve and the defuel/vent valve being leak free over a temperature range of from -40°F to +180°F and over a pressure range of from 72 pounds per square inch to 6000 pounds per square inch.